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Carbon Dioxide Emissions in Germany – Stagnating in 2004

Hans-Joachim Ziesing

CO_2 emissions from energy consumption in Germany fell by nearly 1% in 2004 from the previous year to a good 834 million tonnes.[1] However, taking into account temperature effects and the reduction in stocks of light heating oil in 2004, which was considerable but is not reflected in the statistics, emissions remained practically unchanged. So the tendency to only a moderate reduction in emissions, that has been apparent for some years now, continued. Nevertheless, Germany is still one of the few industrial countries where CO_2 emissions are now lower than at the start of the 1990s.[2] Energy-induced CO_2 emissions have been reduced by nearly 16% since the (internationally agreed) base year 1990. But as the reduction has been only slight since the mid-1990s the Federal Government's former national reduction target of lowering CO_2 emissions by one quarter from the 1990 level by 2005 has now been abandoned.

However, the target of reducing greenhouse gas emissions so that within the period 2008 to 2012 they will be 21% lower as a whole than in the base year 1990 or 1995 has been made binding in international law.[3] This results from the European 'burden sharing' to achieve the targets in the Kyoto Protocol of 1997, which became binding in international law on 16 February 2005. Greenhouse gas emissions in Germany were reduced by 18.5% – actually around 19% after temperature adjustment – by 2003 from the base year, mainly due to a greater reduction in methane emissions compared with CO_2. However, total greenhouse gas emissions have scarcely altered since the end-1990s, so unless the climate protection measures are continued with persistence there is a risk of failing to meet the target for 2008/2012 as well. So there is still considerable need for action. Emissions trading could make a crucial contribution, if appropriate limits for emissions are made binding.

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[1] On the development in primary energy consumption, which causes emissions, in 2004 see Franz Wittke and Hans-Joachim Ziesing: 'Primärenergieverbrauch in Deutschland von hohen Energiepreissteigerungen und konjunktureller Belebung geprägt', in: *Wochenbericht des DIW Berlin,* no. 7/2005.

[2] See Hans-Joachim Ziesing: 'Nach wie vor keine sichtbaren Erfolge der weltweiten Klimaschutzpolitik', in: *Wochenbericht des DIW Berlin,* no. 37/2004.

[3] 1990 is the base year for carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O); however, for partly halogenised hydro-flurorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) 1995 can be chosen as the base year, as the practice in Germany.

Table 1

Energy-Induced CO_2 Emissions in Germany 2003 and 2004 by Energy Sources

	CO_2 emissions		Changes 2004 over 2003		Shares	
	2003	2004			2003	2004
	Million tonnes			%		
			Unadjusted figures			
Solid fuels	374.4	367.8	–6.6	–1.8	44.5	44.1
Liquid fuels[1]	297.7	296.4	–1.3	–0.4	35.4	35.5
Gaseous fuels	168.6	169.2	0.6	0.4	20.0	20.3
Others[2]	0.9	0.9	0.0	–3.2	0.1	0.1
Total	841.7	834.4	–7.3	–0.9	100.0	100.0
			Temperature- and stock-adjusted figures			
Solid fuels	375.6	369.1	–6.5	–1.7	43.9	43.1
Liquid fuels[1]	303.1	309.5	6.4	2.1	35.4	36.1
Gaseous fuels	175.5	176.6	1.1	0.6	20.5	20.6
Others[2]	1.0	1.0	0.0	0.2	0.1	0.1
Total	855.3	856.2	1.0	0.1	100.0	100.0

Deviations in sums due to rounding. All figures preliminary.
1 Without consumption of aircraft fuel for international flights (80% of total air traffic consumption of tanked aircraft fuel in Germany). — 2 Including statistical differences.
Source: DIW Berlin calculations.

According to initial estimates, energy-induced emissions of CO_2 in Germany amounted to good 834 million t in 2004, before adjustment for temperature and stock reduction effects. So they were around 7 million tonnes or 0.9% lower than in 2003.[4] The reduction was mainly due to lower consumption of hard coal and petroleum products, and the higher share of non-emittive energy sources like wind and hydro power and nuclear energy. This more than compensated for the greater use of lignite and natural gas, which increased emissions. As a whole, solid fuels accounted for around 44% of energy-induced CO_2 emissions, liquid fuels just under 36% and gaseous fuels around one fifth.

The development in CO_2 emissions is closely connected to the changes in primary energy consumption; so it is also subject to the weather, although this influence was only slight in 2004. Much greater was the effect of the considerable reduction in stocks of light heating oil (HEL) last year, when consumption was far above the sales of oil registered in the statistics. Utilisation of HEL tank capacities was much lower at the end of 2004 than at the end of 2003, as purchasers held back, mainly on price reasons. So HEL consumption was at least 3 million tonnes higher than is shown in the statistics, causing an increase of a good 7 million tonnes in CO_2 emissions. With the inclusion of this amount total energy-induced CO_2 emissions remained practically constant in 2004, and including temperature effects they were actually 1 million tonnes or 0.1% higher than in 2003 (cf. table 1).

The longer-term development in CO_2 emissions

If the longer-term trend in CO_2 emissions is analysed it becomes clear that after the strong fall in the early 1990s, which was mainly due to reunification, the reduction in emissions was only relatively slight. In 2004 energy-induced CO_2 emissions were about 162 million tonnes lower than in 1990, after adjustment for temperature and stock reduction effects, but about 133 million tonnes of this, or around 82%, came in the period 1990 to 1995 (cf. table 2). The magnitude of the fall in this period can only be explained by the drastic reduction in the new Federal states. For while CO_2 emissions there were a good 130 million tonnes or 44% lower in 1995

[4] The calculations of CO_2 emissions are based on the energy data published by the Working Party on Energy Balance Sheets and the national inventory report by the Federal Environment Office of 14 January 2005. Unless otherwise stated only energy-induced CO_2 emissions are considered here.

Table 2

Energy-Induced CO_2 Emissions in Germany 1990 to 2004 by Energy Sources

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000[1]	2001[1]	2002[1]	2003[1]	2004[1]
							Unadjusted CO_2 emissions in million tonnes								
Solid fuels	557.2	491.2	442.1	417.3	405.1	393.4	390.9	374.6	366.3	350.6	365.9	366.6	370.7	374.4	367.8
Liquid fuels[2]	313.2	336.9	339.0	346.5	336.8	336.6	346.0	337.6	335.0	322.0	312.5	318.2	305.9	297.7	296.4
Gaseous fuels	114.9	123.4	122.5	129.8	135.5	145.1	162.1	154.9	157.3	157.9	155.1	164.4	163.4	168.6	169.2
Others[3]	3.5	2.1	2.1	2.6	3.0	1.1	1.0	1.0	1.1	1.1	1.1	1.1	1.1	0.9	0.9
Total	988.9	953.6	905.6	896.1	880.4	876.1	900.0	868.1	859.6	831.6	834.6	850.4	841.1	841.7	834.4
							Total changes in unadjusted CO_2 emissions in million tonnes from ...								
1990	x	–35.2	–83.3	–92.8	–108.5	–112.8	–88.9	–120.8	–129.2	–157.2	–154.3	–138.5	–147.8	–147.2	–154.4
Previous year	x	–35.2	–48.0	–9.5	–15.7	–4.3	23.9	–31.9	–8.4	–28.0	3.0	15.8	–9.3	0.6	–7.3
							Total changes (%) in unadjusted CO_2 emissions from ...								
1990	x	–3.6	–8.4	–9.4	–11.0	–11.4	–9.0	–12.2	–13.1	–15.9	–15.6	–14.0	–14.9	–14.9	–15.6
Previous year	x	–3.6	–5.0	–1.1	–1.8	–0.5	2.7	–3.5	–1.0	–3.3	0.4	1.9	–1.1	0.1	–0.9
							Structure (%) of unadjusted CO_2 emissions								
Solid fuels	56.4	51.5	48.8	46.6	46.0	44.9	43.4	43.2	42.6	42.2	43.8	43.1	44.1	44.5	44.1
Liquid fuels[2]	31.7	35.3	37.4	38.7	38.3	38.4	38.4	38.9	39.0	38.7	37.4	37.4	36.4	35.4	35.5
Gaseous fuels	11.6	12.9	13.5	14.5	15.4	16.6	18.0	17.8	18.3	19.0	18.6	19.3	19.4	20.0	20.3
Others[3]	0.4	0.2	0.2	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
							Temperature- and stock-adjusted[4] CO_2 emissions in million tonnes of unadjusted CO_2 emissions								
Solid fuels	571.6	492.7	450.0	419.8	412.8	396.3	387.1	376.7	368.0	353.3	368.7	367.7	372.6	375.6	369.1
Liquid fuels[2]	321.2	338.2	348.3	349.8	346.8	340.4	337.7	342.6	341.6	332.4	324.5	323.5	314.8	303.1	309.5
Gaseous fuels	121.4	124.5	128.8	132.2	143.9	147.8	153.3	158.5	162.9	168.4	168.8	170.6	174.3	175.5	176.6
Others[3]	3.7	2.2	2.2	2.6	3.2	1.1	1.0	1.0	1.1	1.2	1.2	1.2	1.2	1.0	1.0
Total	1018.0	957.6	929.3	904.4	906.6	885.5	879.2	878.9	873.6	855.4	863.1	863.1	862.9	855.3	856.2
							Changes in temperature- and stock-adjusted[4] CO_2 emissions in million tonnes from ...								
1990	x	–60.4	–88.7	–113.6	–111.4	–132.5	–138.8	–139.1	–144.4	–162.6	–154.9	–154.9	–155.1	–162.7	–161.8
Previous year	x	–60.4	–28.3	–25.0	2.2	–21.1	–6.3	–0.3	–5.3	–18.2	7.8	–0.1	–0.2	–7.6	1.0
							Changes (%) in temperature- and stock-adjusted[4] CO_2 emissions from ...								
1990	x	–5.9	–8.7	–11.2	–10.9	–13.0	–13.6	–13.7	–14.2	–16.0	–15.2	–15.2	–15.2	–16.0	–15.9
Previous year	x	–5.9	–3.0	–2.7	0.2	–2.3	–0.7	0.0	–0.6	–2.1	0.9	0.0	0.0	–0.9	0.1
							Structure (%) of temperature- and stock-adjusted[4] CO_2 emissions								
Solid fuels	56.2	51.4	48.4	46.4	45.5	44.7	44.0	42.9	42.1	41.3	42.7	42.6	43.2	43.9	43.1
Liquid fuels[2]	31.5	35.3	37.5	38.7	38.3	38.4	38.4	39.0	39.1	38.9	37.6	37.5	36.5	35.4	36.1
Gaseous fuels	11.9	13.0	13.9	14.6	15.9	16.7	17.4	18.0	18.6	19.7	19.6	19.8	20.2	20.5	20.6
Others[3]	0.4	0.2	0.2	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Deviations in sums due to runding.
1 Preliminary figures. — 2 Without consumption of aircraft fuel for international flights (80% of total air traffic consumption of tanked aircraft fuel in Germany). — 3 Including statistical differences. — 4 Stock-adjustment only for 2004.
Sources: Energy Balance Sheet Co., Federal Environment Office; German Metereological Service; DIW Berlin calculations.

than in 1990, they rose in the old Federal states, even if only slightly at around 2%.

Compared with the period 1990 to 1995 CO_2 emissions then fell only a little in the years to 2004, by around 29 million tonnes or 3.3%. After falling strongly on average from 1990 to 1995, namely by just under 27 million tonnes a year, CO_2 emissions fell by only about 3 million tonnes a year on average from 1995 to 2004.

Emission intensity in the economy as a whole, that is, the ratio of CO_2 emissions to real GDP, has fallen more strongly than absolute CO_2 emissions (cf. table 3 and figure 1). In 2004 around 30% less CO_2 was emitted

Table 3

Key Data on the Development in Primary Energy Consumption and CO_2 Emissions in Germany 1990, 1995, 2000 and 2004

Temperature-adjusted figures[1]

	1990	1995	2000[2]	2004[2]	Annual average change (%)		
					1990 to 1995	1995 to 2000	2000 to 2004
Population (annual average) in millions	79.4	81.7	82.1	82.5	0.6	0.1	0.1
Gross domestic product (GDP) in bill. euros at 1995 prices	1 671	1 801	1 970	2 018	1.5	1.8	0.6
Per capita GDP in 1 000 euros	21.1	22.1	24.0	24.5	0.9	1.7	0.5
Primary energy consumption (PEC) in petajoules	15 345	14 437	14 896	14 844	–1.2	0.6	–0.1
PEC of fossil energy sources in petajoules	13 553	12 500	12 669	12 589	–1.6	0.3	–0.2
Share (%) of non-emittive energy sources in PEC	11.7	13.4	15.0	15.2	2.8	2.2	0.4
Energy-induced CO_2 emissions in million tonnes	1 018.0	885.5	863.1	856.2	–2.7	–0.5	–0.2
Per capita PEC in gigajoules	193	177	181	180	–1.8	0.5	–0.2
Per capita CO_2 emissions in tonnes CO_2	12.8	10.8	10.5	10.4	–3.3	–0.6	–0.3
CO_2 content of fossil PEC in tonnes CO_2/Tj	66.3	61.3	57.9	57.7	–1.6	–1.1	–0.1
Macroeconomic energy intensity in Tj/billion euros of GDP	9 184	8 015	7 563	7 355	–2.7	–1.2	–0.7
Macroeconomic CO_2 intensity in tonnes CO_2/million euros of GDP	609	492	438	424	–4.2	–2.3	–0.8

1 2004 figures also stock-adjusted. — 2 Some data preliminary.
Sources: Energy Balance Sheet Co., Federal Environment Office; German Metereological Service; DIW Berlin calculations.

than in 1990 per unit of real GDP in 1995 prices. That is a temperature-adjusted fall of 2.6%, on average for each year in the period 1990 to 2004. The reduction rates slackened considerably over time. Whereas they were still 4.1% a year in the first half of the 1990s, in the second half they were only 2.3% and from 2000 to 2004 only 0.8%.

To gain an impression of the effects of the various determinants an analysis was made of the extent the changes in temperature-adjusted CO_2 emissions can be shown as due to changes in

- the population (the demographic component)
- per capita GDP (the income component)
- energy intensity in the economy as a whole (the energy intensity component)
- the share of CO_2-free energy sources (the energy-mix component) and
- the average CO_2 content in fossil fuels used (the CO_2 content component).[5]

A distinction is drawn between two periods of the same length, 1990 to 1997 and 1997 to 2004. It becomes clear that the effects of the higher per capita GDP and the growth in the number of inhabitants in both periods in increasing emissions could be more than compensated by the reductive effects of the lower energy intensity and the lower CO_2 content of the fossil energy sources, and the higher share of non-emittive energy sources (cf. figure 2). However, it also becomes clear on a comparison of the two periods that the reductive effects of the energy intensity, the energy mix and the CO_2 content have weakened considerably. Whereas the falling energy intensity in itself reduced emissions by 125 million tonnes from 1990 to 1997, from 1997 to 2004 the reduction was only 79 million tonnes. And whereas the average CO_2 content in total primary energy consumption fell by 75 million tonnes from 1990 to 1997 the fall from 1997 to 2004 was only 17 million tonnes. In the early 1990s the abrupt change in the structure of energy sources, with a particular fall in (highly emittive) lignite consumption, contributed to the strong fall in emissions, but this tendency has weakened considerably in recent years, indeed in some it has actually been reversed. From 1990 to 2004 the share of non-emittive energy sources in primary energy consumption rose relatively continuously, moving from just under 12% to a good 15%. Nuclear energy is still playing the biggest part here, but the contribution of renewable energy sources, particularly wind power and biomass (chiefly firewood) has clearly increased.

Falling energy intensity almost always plays the biggest part in reducing emissions. The effect of a growing population in increasing emissions was still clearly

[5] On the method of component analysis used here see Jochen Diekmann, Wolfgang Eichhammer, Anja Neubart, Heilwig Rieke, Barbara Schlamm and Hans-Joachim Ziesing: 'Energie-Effizienz-Indikatoren. Statistische Grundlagen, theoretische Fundierung und Orientierungsbasis für die politische Praxis', Heidelberg 1999.

felt in the early 1990s but this has now largely ceased. But in almost every year per capita income in the economy as a whole has been the biggest component in increasing emissions. Per capita adjusted energy-induced CO_2 emissions fell at first in the 1990s rapidly, from 12.8 tonnes of CO_2 in 1990 to 10.8 tonnes in 1995, but after that the fall was only slight (to 10.4 tonnes in 2004). Per capita CO_2 emissions in Germany are thus still more than two and a half times as high as the world average, even if this is only about half the per capita emission in the United States.

The sectoral development[6]

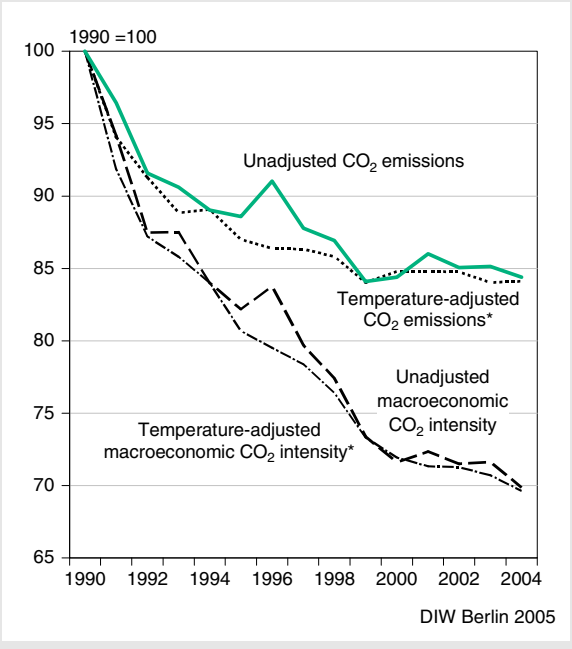
The sectoral structure of energy-induced CO_2 emissions changed considerably in the 1990s (cf. table 4). In 2003 the energy sector was still by far the biggest emitter, with a share of a good 45% in total CO_2 emissions (including those from industrial processes). It was followed by transport with nearly one fifth, clearly ahead of private households with 14%, industry with a good 12% and commerce, trade and services with 7%.

The biggest absolute fall in CO_2 emissions from the base year 1990 was in industry, at around 62 million tonnes (–40.2%), followed by the energy sector with just under 57 million tonnes (–12.8%) and commerce, trade and services with about 30 million tonnes (–33.5%). Private households emitted about 7 million tonnes less in 2003 than in 1990 (–5.3%).

The temperature plays a particularly big part in emissions by private households, owing to the predominance of heating in their energy consumption. Unadjusted CO_2 emissions in 2003 were around 14% lower than in the particularly cold year 1996, but after adjustment for temperature effects the figure was only around 1% lower. The temperature-adjusted figure shows a fall of around 8% from 1990, bigger than that in unadjusted emissions (–5%). In commerce, trade and services, too, the unadjusted fall from 1996 to 2003 was nearly one quarter, while the temperature-adjusted fall was only 17%. But the deviations for the period 1990 to 2003 as a whole are very slight (cf. figure 3).

Figure 1

CO_2 Emissions and Macroeconomic CO_2 Intensity in Germany 1990 to 2004



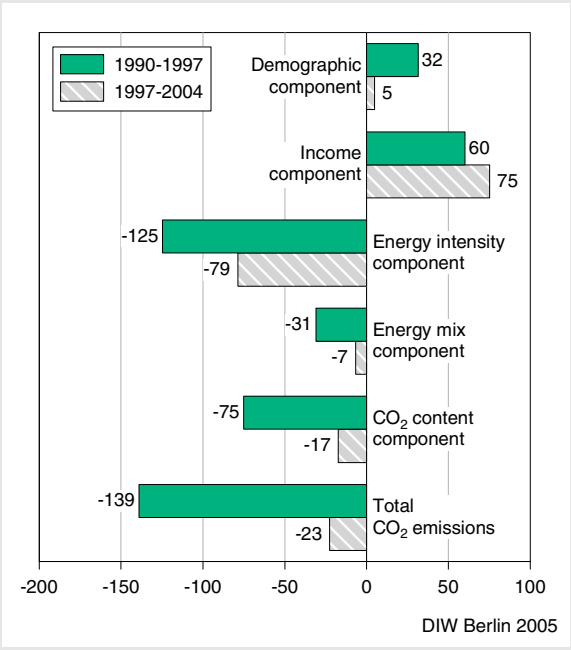
* 2004 also stock-adjusted.

Sources: Energy Balance Sheet Co., Federal Environment Office; German Metereological Service; Federal Statistical Office; DIW Berlin calculations.

Figure 2

Energy-Induced CO_2 Emissions[1] in Germany by Determinants

Changes in million tonnes CO_2



1 Temperature-adjusted and for 2004 also stock-adjusted.

Sources: Energy Balance Sheet Co., Federal Environment Office; German Metereological Service; Federal Statistical Office; DIW Berlin calculations.

[6] The development outlined here basically covers the period 1990 to 2003, as the sectoral data on energy consumption is not available for later dates. The emission figures are also unadjusted. The sectoral classification follows the system used in the German energy balance sheets.

Table 4

CO_2 Emissions in Germany 1990 to 2003 by Sectors as Classified in the Energy Balance Sheet

	Unadjusted CO_2 emissions in million tonnes						Structure of CO_2 emissions (%)				Changes in CO_2 emissions from 1990 (%)			
	1990	1995	2000[1]	2001[1]	2002[1]	2003[1]	1990	1995	2000[1]	2003[1]	1991	1995	2000[1]	2003[1]
Energy sector	441.6	379.2	364.0	368.9	378.1	385.1	43.5	42.0	42.3	44.5	–3.1	–14.1	–17.6	–12.8
Power stations	356.2	322.1	311.5	315.6	326.1	334.1	35.1	35.7	36.2	38.6	–1.4	–9.6	–12.5	–6.2
Thermal power stations/Long-distance thermal power stations and others conversion sectors	85.4	57.1	52.5	53.3	52.0	51.1	8.4	6.3	6.1	5.9	–10.3	–33.2	–38.6	–40.2
Other mining, non-metallic minerals extraction, manufacturing	169.3	126.7	116.3	113.9	111.3	107.3	16.7	14.0	13.5	12.4	–13.5	–25.2	–31.3	–36.6
Transport (national)[2]	158.1	172.5	178.3	174.6	172.5	166.5	15.6	19.1	20.7	19.2	2.2	9.1	12.8	5.3
Rail	2.9	2.3	1.9	1.8	1.7	1.6	0.3	0.3	0.2	0.2	–10.1	–19.8	–32.9	–44.0
Road	150.3	165.0	171.1	167.7	165.9	159.8	14.8	18.3	19.9	18.5	2.5	9.8	13.9	6.4
Air (national)	2.9	3.5	4.4	4.2	4.2	4.3	0.3	0.4	0.5	0.5	–1.9	19.8	50.2	48.0
Coastal and inland shipping	2.0	1.7	0.9	0.8	0.7	0.8	0.2	0.2	0.1	0.1	1.0	–14.9	–57.2	–62.5
Households	129.3	129.2	116.8	131.2	120.1	122.4	12.7	14.3	13.6	14.2	1.7	–0.1	–9.6	–5.3
Commerce, trade and services[2]	90.6	68.5	59.2	61.8	59.1	60.3	8.9	7.6	6.9	7.0	–4.8	–24.4	–34.7	–33.5
Total energy-induced emissions	988.9	876.1	834.6	850.4	841.1	841.7	97.4	97.1	97.0	97.3	–3.6	–11.4	–15.6	–14.9
Process-induced emissions	26.2	26.2	25.5	23.4	22.7	23.7	2.6	2.9	3.0	2.7	–11.0	–0.1	–2.8	–9.9
Total	1015.0	902.2	860.1	873.8	863.8	865.4	100.0	100.0	100.0	100.0	–3.8	–11.1	–15.3	–14.8

1 Preliminary figures. — 2 Without international air traffic (estimated at 80% of total air traffic consumption of tanked fuel in Germany). — 3 Including military barracks and offices.
Sources: Federal Environment Office; National Emissions Inventory 2005; Eco Institute; DIW Berlin calculations.

The development in transport-induced emissions is remarkable, showing a rise of around 15% from 1990 to 1999 to just under 182 million tonnes CO_2. For a variety of reasons, however, from then until 2003 they fell continuously, by altogether 8.5% to 166.5 million tonnes.[7] But there was a rise again in 2004, if only a slight one of 0.8 million tonnes. Altogether it is evident that, like private households, transport has so far made only a small contribution to reducing emissions compared with all the other sectors.

Greenhouse gas emissions

Carbon dioxide (CO_2) is by far the most important greenhouse gas, with a share of around 85%, but the international obligations to reduce emissions entered into with the Kyoto Protocol cover a group of six greenhouse gases, which beside CO_2 include methane (CH_4), nitrous oxide (N_2O) and part-halogenised hydro-fluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6). Emissions of these six greenhouse gases together fell by 18.5% from 1990 to 2003, with the biggest fall compared with CO_2 emissions in methane (1990 to 2003 –43%). With the exception of HFCs, which showed a powerful increase, emissions of the other gases also fell, if by less significant amounts.

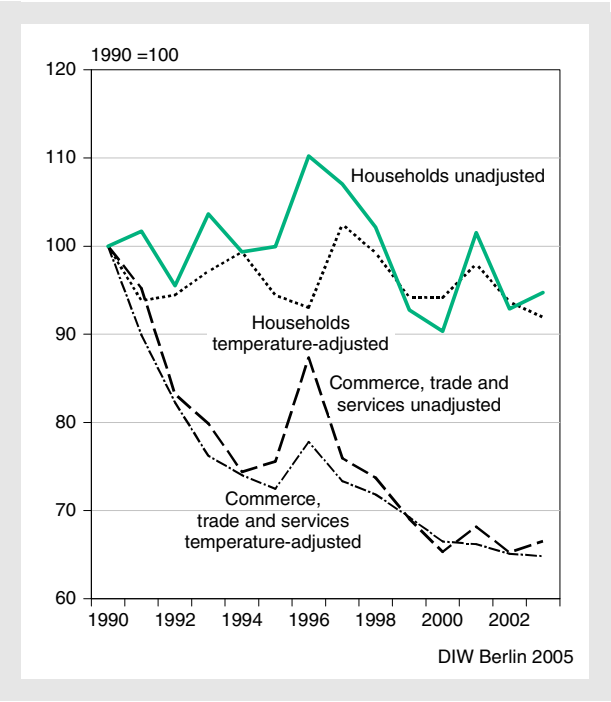
Germany has already come fairly close to the target agreed as part of European burden sharing, namely to reduce its greenhouse gas emissions by 21% by 2008/2012. It only needs a further reduction of around 3% from the 2003 level, or a good 31 million tonnes of CO_2 equivalents, which is 4.5 million tonnes on average each year. Taking the CO_2 figures for 2003, adjusted for the effects of the temperature and stock reductions, the 'gap' widens to around 45 million tonnes of CO_2 equivalents, so emissions would still need to be reduced by nearly 4.5% from the adjusted figure for 2003. According to current estimates of the future development in greenhouse gas emissions it is to be feared that without additional climate protection policy measures not even that gap can be entirely closed. It is expected that a difference of one percentage point will remain in 2010.[8]

[7] See also Jutta Kloss, Hartmut Kuhfeld and Uwe Kunert: 'Strassenverkehr: Eher Ausweichreaktionen auf hohe Kraftstoffpreise als Verringerung der Fahrleistungen', in: *Wochenbericht des DIW Berlin,* no. 41/2004.

[8] See Peter Markewitz and Hans-Joachim Ziesing (ed.): 'Politikszenarien für den Klimaschutz. Langfristszenarien und Handlungsempfehlungen ab 2012 (Politikszenarien III)', Studies for the Federal Environment Office, in: *Schriften des Forschungzentrums Jülich,* Reihe Umwelt, vol. 50, Tables 3, 11-2, p. 278.

Figure 3

Unadjusted and Temperature-Adjusted CO_2 Emissions by Private Households and the Commerce, Trade and Services Sector



Sources: Energy Balance Sheet Co., German Metereological Service; Federal Environment Office; DIW Berlin calculations.

On principle, the instrument of emissions trading now introduced for the period 2005 to 2007 is a suitable way to achieve the targets undertaken in the Kyoto Protocol. However, the emissions targets already set in the allocation law of 2007 for the period 2008 to 2012 for the sectors participating in the trading – mainly energy and industry – are relatively generous, and for the sectors not participating in the trading – mainly transport and private households – measures are still awaited to implement the prescribed targets.[9] But most studies show considerable potential for reducing emissions precisely in the two sectors that are not affected by emissions trading, and this needs to be exploited. It will depend on the concrete terms of the national allocation plan, which is to be presented by June 2006, whether the binding targets for 2008/2012 can really be met.

Conclusion

Energy-induced CO_2 emissions in Germany were just under 16% lower in 2004 than in 1990, after adjustment for temperature and stock reduction effects. However, in the course of the 1990s the fall in emissions slackened noticeably. The original target of reducing CO_2 emissions by 25% from 1990 by 2005 will not be met; it would require the present level to fall by more than 100 million tonnes, and as this is *de facto* impossible the target has now been abandoned.

But now the concern must be to achieve at least the less ambitious target of reducing greenhouse gas emis-

[9] See the Act on the National Allocation Plan for Greenhouse Gas Emissions Entitlements in the Allocation Period 2005 to 2007 (Allocation Law 2007 – ZuG 2007); here particularly § 4, which lays down the national emissions targets not only for the period 2005 to 2007 but also for the following period, 2008 to 2012, although this may be revised.

Table 5

Greenhouse Gas Emissions in Germany 1990 to 2003 by Gases

	Greenhouse gas emissions in million tonnes CO_2 equivalents				Structure of greenhouse gas emissions (%)				Changes in greenhouse gas emissions from 1990[1] (%)		
	Base year 1990/ 1995[1]	1995	2000[2]	2003[2]	Base year 1990/ 1995[1]	1995	2000[2]	2003[2]	1995	2000[2]	2003[2]
CO_2 emissions[3]	1015.0	902.2	860.1	865.4	81.3	81.8	84.6	85.0	–11.1	–15.3	–14.7
Methane (CH_4)	132.1	104.9	82.9	75.2	10.6	9.5	8.2	7.4	–20.6	–37.2	–43.1
Nitrous oxide (N_2O)	86.4	80.9	62.2	63.7	6.9	7.3	6.1	6.3	–6.4	–28.0	–26.3
HFC	6.4	6.4	6.6	8.2	0.5	0.6	0.7	0.8	0.0	4.2	29.7
PFC	1.8	1.8	0.8	0.8	0.1	0.2	0.1	0.1	0.0	–55.1	–55.3
SF_6	6.6	6.6	4.0	4.2	0.5	0.6	0.4	0.4	0.0	–39.4	–36.7
Total non-CO_2 emissions	232.2	200.6	156.5	152.1	18.7	18.2	15.4	15.0	–14.0	–32.9	–34.8
All greenhouse gases[3]	1248.3	1102.8	1016.6	1017.5	100.0	100.0	100.0	100.0	–11.7	–18.6	–18.5

1 Base year: 1990 for CO_2, CH_4 and N_2O); 1995 for HFC, PFC and SF_6. — 2 Preliminary figures. — 3 Without changes in land use and forestry.
Sources: Federal Environment Office; National Emissions Inventory 2005; DIW Berlin calculations.

sions by 21% by 2008/2012, a target that has been made binding in international law. Considering the reduction to date of 18.5% the gap from this figure is relatively small, but it has hardly shrunk in recent years. As the reduction trend in CO_2 and greenhouse gas emissions as a whole has been scarcely perceptible in recent years, efforts will need to be intensified in climate protection policy to ensure that this target can be met. For the rest it should not be forgotten that greenhouse gas emissions will have to be reduced even more beyond 2012 if the catastrophic effects of climate change that are feared are to be adequately counteracted.